RESEARCH BULLETIN 703 APRIL, 1951

Crossbreeding Beef Cattle

A Comparison of the Hereford and Aberdeen Angus Breeds and Their Reciprocal Crosses

OHIO AGRICULTURAL EXPERIMENT STATION

WOOSTER, OHIO

CONTENTS

ON THE COVER: A group of the crossbred heifers, sired by an Angus bull. These were from the seventh calf crop.

CROSSBREEDING BEEF CATTLE

A Comparison of the Hereford and Aberdeen Angus Breeds and Their Reciprocal Crosses

PAUL GERLAUGH, L. E. KUNKLE, and D. C. RIFE*

Crossbreeding beef cattle is not new. Much of the earlier crossbreeding work was concerned with carcass yield and quality rather than with production problems, including feed lot performance.

Experiences of many commercial hog and lamb producers, as well as experiment station investigations, indicate that crossbreeding has produced desirable feed lot animals.

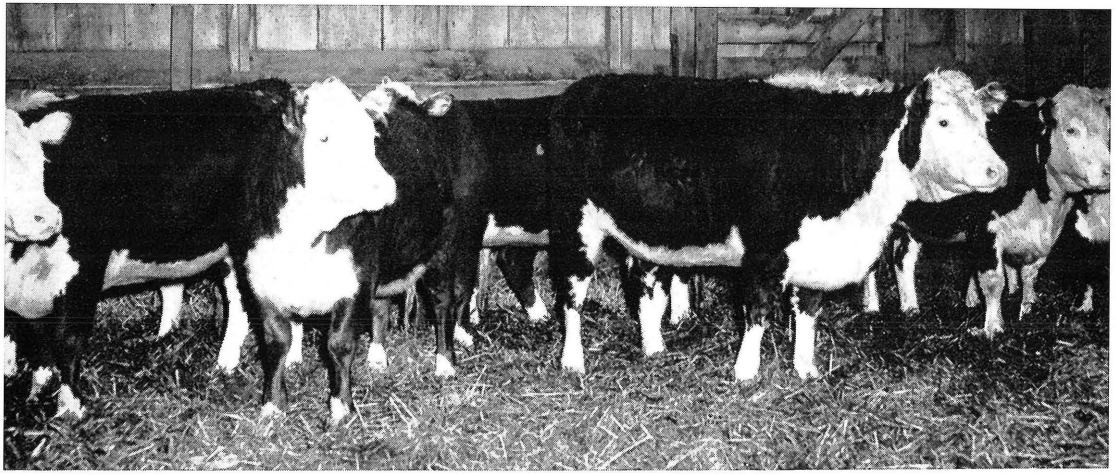
In the case of beef cattle, more information was needed relative to the results of crossbreeding. A project was started at the Ohio Station in 1939 to determine, if possible, the advantages and disadvantages of crossing the Aberdeen Angus and Hereford breeds of cattle. All cattle used in the test were purchased from Ohio breeders. The project covered the various phases of producing beef cattle, including the feedlot phases. Information on dressing percentage and carcass grades also was obtained.

EXPERIMENTAL

Twenty-eight each of purebred Aberdeen Angus heifers and purebred Hereford heifers were purchased to serve as the foundation females for the project. All of the heifers were open except three of the Hereford heifers that had been pasture-bred at time of purchase. A few heifers of each breed were replaced the second season because of failure to conceive. After these replacements were made, no more females were added during the test. Eight calf crops were raised and marketed. During this period, a few cows were lost from death or because of breeding difficulties. (These were losses that might be expected in any breeding herd.)

---

* Graydon W. Brandt, formerly a member of the Department of Animal Husbandry at The Ohio State University, was connected with the project during its organization and early development. Clark Martin was in charge of the breeding herd and the calves until the calves went to the feedlot. Fred Graber and Hall Moats were in charge of the calves during the feedlot phases.



A part of the purebred Hereford heifers from the seventh calf crop, shown near the end of the feed lot period.

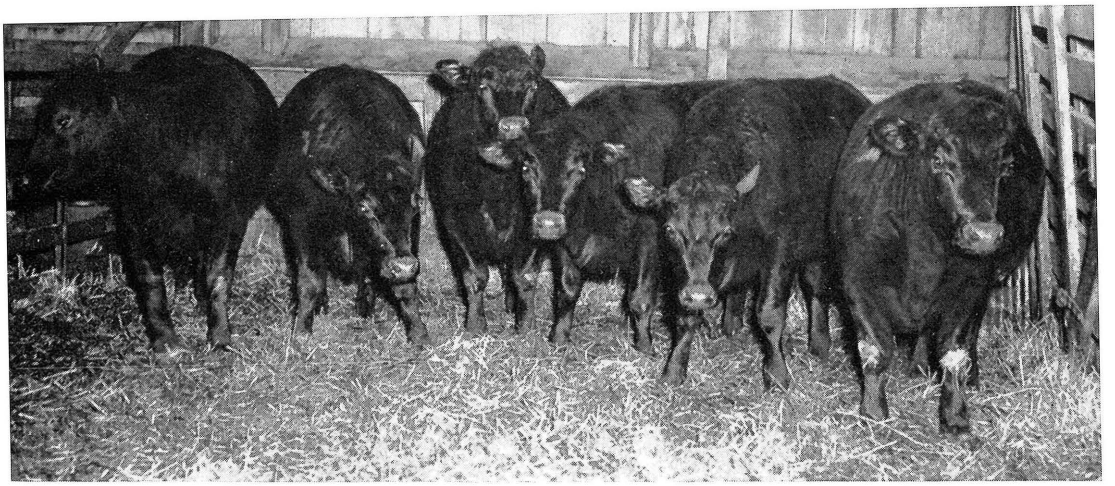
All the animals used in the test were negative to the blood test for Brucellosis when purchased. Blood samples were drawn annually before turning the cows to pasture. The herd remained free of Brucellosis throughout the test.

One-half of the Angus heifers and one-half of the Hereford heifers were put together and made up herd A. The other half of the heifers of each breed made up herd B. The herds were housed together throughout the experiment, and because of that, the Herefords were dehorned.

The first year, the heifers in herd A were bred to a purebred Angus bull and the heifers in herd B to a purebred Hereford bull. The second year, the cows in herd A were bred to the Hereford bull that was used in herd B the first year. The Angus bull used in herd A the first year was used in herd B the second year. This procedure resulted in purebred Angus calves, purebred Hereford calves and crossbred calves of each cross each year and it overcame seasonal differences.

At the end of each two-year period, a new bull of each breed was obtained and the breeding procedure described previously was repeated.

Theoretically, this plan would have produced a purebred and a crossbred calf from each cow by each of the four pairs of bulls. Practically, the system did not always work because some days in the breeding season more cows were found in heat in one of the herds than could be bred that day while too few were found in the other herd. This frequently resulted in shifting breeding plans. When this occurred, an attempt was made the following year to regroup the cows to fit the original program.



A group of the purebred Angus steers from the seventh calf crop, shown near the end of the feed lot period.

Herd Management

The cows were bred starting in late October. This resulted in the first calves being dropped in late July and continuing through the fall months. A few December and early January calves were born during the test. It seemed desirable to have the calf crop dropped during the late summer and fall because of pasture, feed, and housing conditions and because the cow herd was in the barn at breeding time when daily observations could be maintained.

Occasionally, cows came in heat out of breeding season. They were not bred in order to avoid having to use a calf that would not fit well into the test.

All cows ran loose in the stables. Outside lots were available and the cows were permitted to run to these outside lots unless the weather became severe.

Permanent bluegrass and white clover pastures were available during the grazing season, which usually started about May 10. When pastures became inadequate during late summer, some silage, either corn or hay, was fed.

In winter quarters, the cows were usually fed 30 to 35 pounds of corn silage daily per cow, one pound of soybean oil meal and free choice of a mineral mixture and salt. Shredded corn stover was used for both feed and bedding. Mixed clover and timothy hay was used on a few occasions for the cow herd. Because both Angus and Hereford cows were together in the stables, no information is available on the relative amounts of feed consumed by the two breeds.

The bulls were given a generous allowance of good quality hay and protein supplement. Some grain was fed during the breeding season, and an outside grass paddock was available during both winter and summer.

Calf creeps were made available in each of the stables. A ration of silage, hay, corn-and-cob meal, and one-half pound of protein supplement per calf daily was available.

The cow herd was weighed before going to pasture and at the close of the grazing season. The bulls were weighed frequently. The calves were weighed at birth and at 4-week intervals, starting in early November. Bull calves were castrated at not more than 8 weeks of age.

Bulls Used in the Test

All the bulls used were registered. Usually bulls nearing two years of age were purchased. It was attempted to select bulls of medium size for their respective breeds. The first Hereford bull purchased grew noticeably larger than anticipated. The effect of this size factor will be discussed later.

The first Angus bull met with an accident early in the second breeding season. A half-brother of similar size and type was obtained as a replacement.

ANGUS BULLS

	Registration Number	Average Weight
Erwin's Masquerader	502,321	1,750 lb.
Enchanter of Elmwood 2nd	549,924	1,800 lb.
Envision	557,715	2,000 lb.
Buckeye Lad	673,583	1,700 lb.
Berie of Elmwood	729,837	1,650 lb.

HEREFORD BULLS

Each Hereford bull served a two-year period in connection with the test, in this order:

	Registration Number	Average Weight
Orleton Lad 16th	2,529,756	2,050 lb.
Orleton Lad 51st	2,864,987	1,900 lb.
Orleton Lad 139th	3,590,795	1,650 lb.
Orleton Lad 183rd	4,118,168	1,800 lb.

Cows Used in the Test

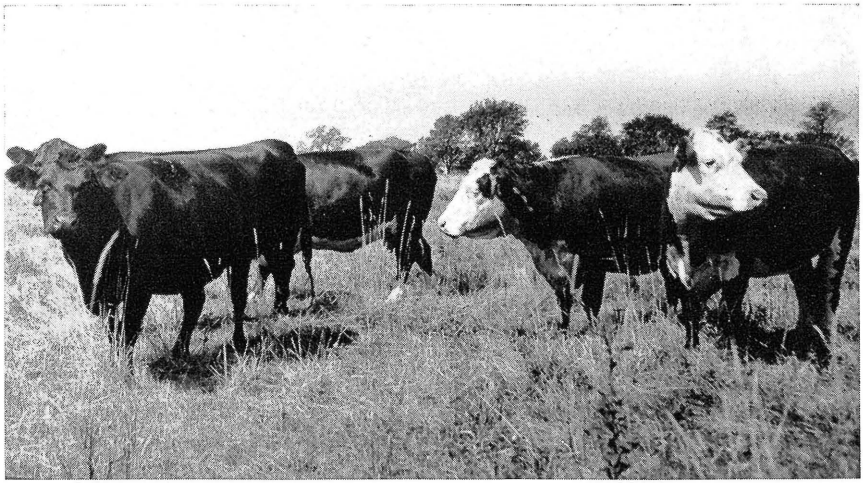
Twenty-seven Aberdeen Angus cows finished the test. They averaged 1,174 pounds, ranging from 858 to 1444 pounds. Twenty-eight Hereford cows finished the test. They averaged 1287 pounds, ranging in weight from 957 to 1560 pounds.

ANGUS COWS — Registry Numbers and Weights

Registration Number	Weight (lb.)	Registration Number	Weight (lb.)
570,743	1165	553,215	1357
570,749	1280	553,213	1245
570,751	1055	553,211	1290
570,747	1360	553,216	1121
570,752	1074	553,218	1013
570,744	1027	555,955	1023
570,746	1142	555,956	1064
570,742	1444	555,957	1100
550,889	1266	555,954	1211
555,695	1398	555,958	1197
550,888	858	584,748	1160
555,713	1072	584,745	1168
553,217	1141	584,751	1231
553,212	1230		

HEREFORD COWS — Registry Numbers and Weights

Registration Number	Weight (lb.)	Registration Number	Weight (lb.)
3,242,177	1398	2,762,528	1241
3,455,084	1272	2,762,529	1303
3,455,082	1043	2,762,533	1429
2,529,764	1226	2,762,531	957
2,594,281	1432	2,762,532	1325
2,594,282	1560	2,762,534	1104
2,594,286	1307	2,762,535	1374
2,681,493	1354	2,762,536	1342
2,681,496	1259	2,762,537	1344
2,681,497	1303	2,762,538	1402
2,681,499	1049	2,762,539	1492
2,762,525	1210	2,865,003	1145
2,762,526	1505	2,865,005	1083
2,762,527	1483	2,741,788	1108



A few of the cows used in the tests. One-half of the cows of each breed were used to make up the two herds.

Management of the Calves

When the test was started, it was planned to feed the first four crops of calves as rapidly as possible to marketable condition. The last four crops of calves were to spend a summer on pasture and then go to the feed lot. With this program in mind, the first four crops of calves were given a generous amount of grain in their creeps, while little grain but a generous supply of roughage was made available in the creeps for the last four calf crops. One-half pound of protein supplement per calf daily was made available in the creeps for all calf crops. The calves were weaned during late April.

The first four calf crops were fed individually in the feed lot. Five pounds of corn silage, one and one-half pounds of mixed clover and timothy hay, one and one-half pounds of soybean oil meal, and as much corn-and-cob meal as they would eat made up the ration. During the first two years, protein supplement was fed at a little higher rate. During the last four years, the calves were brought to the feed lot at the close of the pasture season and fed in their respective sex and breeding groups instead of being fed individually. The calves were, for the most part, sold at the same time. The fourth year, some of the heifers were sold ahead of the others. In the fifth year, several calves were carried a few weeks longer than the others. When the calves were marketed, most of them were in either a good or choice degree of finish. The buyers seldom expressed a price differential between lots when they were pur-

chased. However, the killing and carcass data frequently showed that some price differential was justified although not noticeably apparent in the feed lot.

A standard procedure was followed for handling the calves marketed and for obtaining slaughter and carcass data. The calves were fed and allowed time to eat their late afternoon rations. Water and any surplus feed was removed from the lots the same evening. Individual weights were taken early the following morning. These were shrunk 3 percent for the selling weights. The cattle were trucked to Columbus, Ohio, about 95 miles, and slaughtered the following day. Warm carcass weights were shrunk 2½ percent. The shrunk selling weights and the shrunk carcass weights were used to obtain the dressing percentages.

The carcasses were cooler graded the second day after slaughter. The sides of beef were broken, leaving one rib on the hind quarter. Color readings of the exposed lean tissue were taken. All of the calves finishing the feed lot phase were slaughtered.

RESULTS

The Statistical Laboratory of The Ohio State University analyzed the data of the project. The comments of the laboratory director* as to the significance of results and other comments are included in the discussion of the various phases of the project. A summary of the results obtained is presented in Table 1. Tables 2-10 are in the appendix. They give a detailed report of data from the test.

Gestation Periods

(Table 1)

The 397 gestation periods recorded in the test averaged 282.0 days. This is the generally accepted length of gestation period for beef cattle. In this test, the 101 gestation periods for the purebred Angus calves averaged 276.47 days, for the 100 purebred Hereford calves, 286.28 days, for the 94 crossbred Hereford-Angus calves, 281.98 days, and for the 102 crossbred Angus-Hereford calves, 283.30 days (Table 3).

When carrying purebred calves, both bull and heifer, the gestation period of the Aberdeen Angus cows was ten days shorter than that of the Hereford cows. This difference is statistically significant.

When the Angus cows were bred to Hereford bulls, the resulting gestation periods averaged about 5 days longer than when the Angus cows carried purebred calves. The difference in length of gestation periods of the Angus cows when carrying purebred calves as compared

* Prof. D. R. Whitney, to whom grateful acknowledgment is herewith extended for his cooperation and counsel.

to the gestation periods of these same cows carrying crossbred calves is statistically significant.

When the Hereford cows were bred to Angus bulls, the resulting gestation periods were shortened about three days in comparison with the gestation periods of the Hereford cows when carrying calves sired by Hereford bulls. The difference in length of gestation periods of the Hereford cows carrying purebred calves as compared to Hereford cows carrying crossbred calves is statistically significant.

The difference in gestation periods of the Angus cows carrying crossbred calves is not significantly different from the gestation periods of the Hereford cows carrying crossbred calves.

The difference in gestation periods of the cows carrying bull calves as compared to the gestation periods of the cows carrying heifer calves was one day. This difference is not statistically significant.

The longer than normally accepted gestation period of the Hereford cows, when carrying calves sired by Hereford bulls, accumulated over a period of several years. Should this condition generally prevail, it could be responsible for discarding older, normal animals as nonbreeders when bulls are turned with the cows on a definite date each year.

Another point in this connection is the length of time between calving and "in heat" periods between cows of the two breeds. There is no information on this point in connection with the project but it is of sufficient importance to warrant study.

Birth Weights

(Table 1)

The purebred Angus bull calves averaged 62.4 pounds at birth while the purebred Hereford bull calves weighed 69.2 pounds at birth. This difference is statistically significant and is attributed to the difference of ten days in length of gestation period.

The purebred Angus heifer calves averaged 56.1 pounds at birth while the purebred Hereford heifer calves averaged 67.8 pounds. This difference statistically is significant and cannot be explained entirely by the differences in length of gestation periods.

Crossbred calves, both bulls and heifers, from the Angus cows were heavier at birth than the purebred Angus calves. In the case of the crossbred calves from the Hereford cows, both the bull and heifer calves were lighter in weight at birth than the purebred Hereford calves. There is no significant difference in the birth weights of the two groups of crossbred calves. The calves during the second four-year period averaged 6 pounds heavier than the calves of the first four-

year period (Table 4). This difference is statistically significant and is probably due to the age of the cows.

Since the crossbred calves were more active and stronger at birth, there is reason to think that hybrid vigor was apparent. However, no measurement of this characteristic is available. Calf death losses throughout the test are given on pages 17 and 18.

Gains, Birth to Weaning

(Table 1)

The average weight of all calves at weaning time was 429.0 pounds (Table 5). The average birth weight was 64.3 pounds (Table 4) and the average gain, birth to weaning, for all calves was 364.7 pounds. The average age of all calves at weaning time was 224.4 days, with an average daily gain, birth to weaning, of 1.62 pounds.

The first four crops of calves which were fed grain generously in the creeps gained, on the average, 16 pounds more than the last four crops of calves which were fed grain sparingly and roughage generously, in the creeps. Other factors that may have influenced this difference are age of the dams and relative size of sires. The matter of size of sire will be discussed later.

When the weaning weights listed in Table 1 are adjusted to eliminate the differences in age at weaning, the following adjusted weights are obtained for an eight-year average.

ADJUSTED WEANING WEIGHTS

	PBAA	CBHA	CBAH	PBHH
Steer calves	406.4	401.0	366.9	332.4
Heifer calves	357.3	382.0	339.5	325.0

In order that a pair of averages be significantly different, the sample averages should differ by about 25 pounds.

There are several factors that enter into these gains from birth to weaning such as milk supply of the cows, hybrid vigor, and mature size of the breeds. Of these, milking qualities of the dams is probably the most important. No milk records are available on any of the cows. However, the Angus cows occasionally gave more milk than their calves took, for the first few days or couple of weeks, at the most, necessitating milking the surplus. Seldom was this the case with the Hereford cows.

The steer and heifer calves, both purebred and crossbred, from the Angus cows made more gain from birth to weaning than the corresponding calves from the Hereford cows. This significant difference

TABLE 1.—Eight-Year Summary

	CALVES FROM ANGUS COWS								CALVES FROM HEREFORD COWS							
	Males				Females				Males				Females			
	PBAA		CBHA		PBAA		CBHA		PBHH		CBAH		PBHH		CBAH	
	*		*1		*		*		*		*		*		*	
Gestation period, days	53	277.2	52	282.7	48	275.7	42	281.1	47	287.5	48	283.1	53	285.2	54	283.5
Birth weights, lb	53	62.4	52	65.9	48	56.1	42	62.7	50	69.2	48	67.0	54	67.8	54	62.6
Weaning weights, lb	49	486.2	50	472.6	42	419.7	42	446.9	46	393.7	46	432.4	51	385.7	48	394.3
Age at weaning, days	49	234.7	50	227.3	42	228.7	42	225.5	46	218.7	46	223.6	51	219.2	48	217.9
Av. daily gain, birth to weaning	49	1.80	50	1.79	42	1.59	42	1.70	46	1.48	46	1.63	51	1.45	48	1.52
Av. daily gain on pasture last 4 years only, 150 days	18	1.02	23	1.02	20	.85	23	.92	22	1.08	22	1.10	25	1.09	24	1.07
FEED LOT PERFORMANCE																
Av. daily ration:																
Corn and cob meal, lbs	49	10.5	50	10.2	42	9.8	42	9.8	46	9.1	46	10.4	50	9.0	48	9.8
Soybean oil meal, lbs	49	1.6	50	1.7	42	1.7	42	1.6	46	1.7	46	1.7	50	1.6	48	1.7
Corn silage, lbs	49	5.0	50	5.0		5.0		5.0		5.0		5.0		5.0		5.0
Hay mixed, lbs		1.5		1.5		1.5		1.5		1.5		1.5		1.5		1.5
Av. daily gain	49	1.64	50	1.73	42	1.59	42	1.63	46	1.72	46	1.75	50	1.61	48	1.62
Feed per cwt. gain																
Corn and cob meal, lbs	49	641.0	50	586.0	42	620.0	42	597.0	46	526.0	46	594.0	50	562.0	48	606.0
Soybean oil meal, lbs	49	99.0	50	95.0	42	108.0	42	101.0	46	97.0	46	95.0	50	101.0	48	103.0
Silage, lbs	49	308.0	50	293.0	42	323.0	42	309.0	46	298.0	46	289.0	50	313.0	48	316.0
Hay, lbs	49	96.0	50	94.0	42	102.0	42	102.0	46	96.0	46	94.0	50	103.0	48	102.0
Dressing percentage																
Home live weight less 3%	49	60.32	50	60.76	40	60.31	42	60.77	42	59.60	45	60.12	49	59.77	48	60.56
Hot carcass less 2½%																
Carcass Grades:																
Choice		37		41		30		36		24		30		34		28
Good		12		8		10		6		16		15		15		20
Commercial				1						2**						

*Figures in these columns refer to number of calves used in calculations. ** One of these a cryptorchid.

PBAAM = Purebred Angus male
CBHAM = Crossbred, Hereford bull, Angus cow, male
PBAAF = Purebred Angus female
CBHAF = Crossbred, Hereford bull, Angus cow, female

PBHHM = Purebred Hereford male
CBAHM = Crossbred, Angus bull, Hereford cow, male
PBHHF = Purebred Hereford female
CBAHF = Crossbred, Angus bull, Hereford cow, female

amounted to 45 pounds per calf on the adjusted weight basis. Crossbreeding gave statistically significant increases in gain from birth to weaning in the heifers from the Angus cows and the steer calves from the Hereford cows. The gains of the purebred and crossbred heifer calves from the Hereford cows were not sufficiently different to be statistically significant. The crossbred steer calves from the Angus cows did not gain as much as the purebred Angus steer calves. This experience with the purebred and crossbred steer calves from the Angus cows was noticed in other phases of the test and may raise the question as to whether crossbreeding may respond differently with respect to the sexes within or between some breeds.

Gains on Pasture

(Table 1)

After weaning, the last four calf crops were put on good bluegrass and white clover pasture for the duration of the grazing season. All calves ran together but were rotated between two pastures. Table 1 shows the average daily gains for the four years. Table 7 shows the average daily gains for each year. The first crop of calves that were grazed showed the poorest gains of the four groups. This was influenced by their performance during the last six weeks on poor pasture caused by heat and drouth. Table 1 shows that the average daily gains on pasture for the calves, both purebred and crossbred, from the Hereford cows were greater than the average daily gains of the calves from the Angus cows. This could have been caused for the most part, by the fact that the calves from the Hereford cows had gained less from birth to weaning than the calves from the Angus cows. A calculation of the gains on pasture on the basis of weaning weights shows that a greater than average weaning weight resulted in less than average gain on pasture.

The heifers from the Angus cows gained the least on pasture. This difference cannot be explained by differences in weaning weights. There was no apparent difference in flesh between the various groups at the close of the pasture season.

Performance in the Feed Lot

(Table 1)

Calves went to the feed lot following weaning and were individually fed in the fattening phase the first four years of the test. The last four years, the calves spent about five months on pasture following

weaning and then went to the feed lot and were fed in their respective groups.

Corn silage and hay were fed in the same amounts daily per calf throughout the test. Soybean oil meal was fed in a larger amount during the first two years of the test than during the last six years. The difference in the amount fed to the various groups, (Table 1) is due to the different number of animals in the various lots and the larger amount of protein supplement fed during the first two years.

The corn-and-cob meal consumption varied some between groups from year to year. The steers usually ate more than the heifers. Observation did not show that any group of steers or heifers were consistently eating larger quantities of feed for their relative weights.

Tables 2, 8, and 9 show the average daily gains by years for the various groups. The gains as a whole were not high. On the average, all of the groups made more rapid gains during the last four years than during the first four-year period. This was in part caused by the calves being in better than normal feeder flesh when going to the feed lot, as well as being carried to a better than normal degree of flesh when their respective feed lot phases were closed.

The last four calf crops gained more rapidly in the feed lot than the first four calf crops. Several factors enter this situation. These factors are mentioned without knowing their respective influence.

The first two calf crops were fed protein supplement more liberally than the last six calf crops. The Angus and Hereford bulls that sired the first four calf crops were larger bulls than were the bulls of the respective breeds used during the last four years.

Individual feeding was practiced during the first four years; group feeding during the last four years.

The last four calf crops spent a season on pasture and were older, heavier, and not carrying quite as much flesh when going to the feed lot as the first four calf crops.

In the statistical analysis, the weights of the calves at the start of the feed lot tests were reduced to a similar average initial weight. The length of the feeding period for all calves was recalculated to the same number of days. Under these conditions in the feed lot, the steers outgained the heifers in each of the respective groups. All groups of steers and heifers maintained a similar relative position. Under these conditions, the crossbreds from the Angus cows made the most gain in the feed lot, followed by the purebred Herefords and the crossbreds from the Hereford cows. These groups were not significantly different. Each of these three groups gained significantly more than the purebred Angus steers and heifers.

Tables 8 and 9 show the corn-and-cob meal, supplement, silage, and hay required per hundredweight of gain for the various groups each year. The corn silage and hay were each fed the same amount per animal daily each year so that the amount of these feeds necessary per hundredweight of gain, are in direct ratio to the average daily gains.

The amount of corn-and-cob meal fed varied between groups each year. The amount of soybean oil meal fed the first two years was different than the amount fed later.

Table 2 shows the total amount of corn-and-cob meal and the soybean oil meal required per hundredweight of gain. The purebred Angus steers required more concentrates, corn-and-cob meal plus soybean oil meal, each year than the purebred Hereford steers. With one exception, in the eight years, the same statement was true in comparing the feed required per hundredweight of gain between the purebred Angus heifers and the purebred Hereford heifers. These differences are statistically significant.

In comparing the feed efficiency of the crossbred steers from the Angus cows with the purebred Angus steers, it is found that seven of the eight groups of crossbreds used less feed per hundredweight of gain. In the case of the crossbred heifers from the Angus cows, seven of the eight groups used less feed than the corresponding group of purebred heifers. These differences, while consistent, were not statistically significant. The crossbred steers from the Hereford cows in each of the eight years required more feed per hundredweight of gain than the purebred Herefords. With one exception, the same statement holds when comparing the crossbred heifers from the Hereford cows with the purebred Hereford heifers. These differences are statistically significant.

The crossbreds from the Angus cows were slightly more efficient in converting feed into gains than the crossbreds from the Hereford cows.

There may be some question why the purebred Hereford steers and heifers were consistently more efficient in converting feed into gains than were the purebred Angus steers and heifers. This test presented no tangible evidence to explain this difference other than the relative size of the two breeds. This is discussed later.

Dressing Percentage

(Table 1)

The crossbred steers and heifers from the Angus cows dressed slightly higher than any other group. The purebred Hereford steers and heifers dressed significantly lower than any other group. The crossbreds from the Hereford cows dressed slightly, not significantly, more than the purebred Angus steers and heifers.

Carcass Grades

(Tables 1 and 10)

Grading standards used were those in use prior to January 1, 1951

The steers and heifers did not differ appreciably in the proportion of choice carcasses. The crossbreds from the Angus cows produced the highest proportion of choice carcasses. The purebred Angus steers and heifers were second, followed by the crossbreds from the Hereford cows, and the purebred Herefords, in fourth position respectively. These differences were statistically significant.

Weights of the Cattle

The bulls and cows were weighed two and sometimes three times a year. However, some bulls are uneasy in a barn where a cow herd is kept while others seem perfectly content. This characteristic has considerable influence upon the amount of feed the bulls eat, their condition, and weight. Cow weights are even more difficult to appraise because of the difference in milking qualities. Some cows lose a lot of weight while nursing a calf, others lose comparatively little weight. The stage of pregnancy at weighing time also influences their relative weights.

Influence of Size of Bull

Orleton Lad 16th, the first Hereford bull used, grew larger than anticipated at the time of purchase. Orleton Lad 51st was a smaller bull by 150 to 200 pounds. The calves, both purebred and crossbred, sired by Orleton Lad 51st were on the average about 50 pounds lighter in weight at the close of the test than the calves sired by Orleton Lad 16th.

Envision, the Angus bull used to sire the third and fourth crops of calves, was the largest Angus bull used. He weighed 200 to 250 pounds more than Erwin's Masquerador or Enchanter of Elmwood 2nd. The calves sired by Envision were about 70 pounds per calf heavier at the close of the test than the calves born during the first two years of the test, sired by lighter weight bulls.

It is realized that this is insufficient evidence but it is interesting to note the experience of the heavier Angus bull increasing the weight of the calves sired by him during the same two years that a smaller Hereford bull sired calves lighter in weight than his heavier predecessor.

While the project was designed as a crossbreeding experiment, it became apparent that some factor other than crossbreeding was influencing the weights of the calves at birth and at weaning. This seemed to be due to the size of the bulls being used.

Erwin's Masquerader was the Angus bull used the first year and during the start of the second breeding season. He met with an accident and was replaced by Enchanter of Elmwood 2nd, a half-brother and a bull of much the same size and type. The last three bulls each served a two-year period in the test in the order of listing. (Page 6).

CALVES LOST DURING THE TEST

PBAAM

53 gestations, 49 carcasses

2nd calf crop — calf died at birth
4th calf crop — calf died at 2 months of age
5th calf crop — calf died at 2 months of age
7th calf crop — calf died of Listerellosis at 3 months of age

CBHAM

52 gestations, 50 carcasses

1st calf crop — calf died at 21 days of age
6th calf crop — calf died at 51 days of age

PBAAF

48 gestations, 40 carcasses

2nd calf crop — heifer died in feed lot, 196 days
3rd calf crop — calf died at 12 days of age
5th calf crop — calf died at birth
6th calf crop — abortion, 231 days gestation, no reaction to blood test; not counted in summary
7th calf crop — 4 lost, Listerellosis, 2 to 3 months of age
8th calf crop — heifer died after 111 days in feed lot.

CBHAF

42 gestations, 42 carcasses

PBHHM

47 gestation periods, 50 birth weights, 42 carcasses

1st calf crop — 3 heifers, pasture bred, gestation periods not known, birth weights used.
3rd calf crop — steer died in feed lot after 140 days on feed; steer died in feed lot after 168 days on feed.
5th calf crop — calf died at one day of age, calf died at birth, calf died at one day of age, steer died after 28 days in feed lot.
7th calf crop — calf died at birth, steer died after 70 days in feed lot.

CBAHM

48 gestations, 45 carcasses

1st calf crop — calf died at 11 days of age

5th calf crop — steer died after 154 days in feed lot

7th calf crop — calf died at birth

PBHHF

53 gestations, 54 birth weights, 49 carcasses

2nd calf crop — calf hurt and died at one month of age

5th calf crop — removed from feed lot after 28 days — died

6th calf crop — two calves died at birth

7th calf crop — calf died on pasture; 9 months of age

7th calf crop — calf weighed 64 pounds at birth, showing 224 days gestation on our records. Gestation period not used; birth weight used in summary.

CBAHF

54 gestations, 48 carcasses

3rd calf crop — calf died at birth

6th calf crop — calf died at 32 days

7th calf crop — calf died at birth

7th calf crop — 3 calves died of Listerellosis in October

ABNORMAL COLOR MARKINGS IN THE CALVES

Angus cow No. 27 gave birth to a white-faced, red-bodied, crossbred calf in 1942 and again in 1947.

Hereford cow No. 80 gave birth to an all black crossbred calf in 1940 and again in 1942.

Hereford cow No. 91 gave birth to an all black crossbred calf in 1941 and again in 1947.

SUMMARY

The Hereford and Aberdeen Angus breeds were used in this project to raise eight calf crops. Each year, one-half of the cows of each breed raised purebred calves, while the remainder of each breed raised crossbred calves sired by bulls of the other breed. The following year, the breeding program was reversed, so that each cow raised a purebred and a crossbred calf each two-year period. There were four two-year periods and a different pair of bulls for each period. A total of 397 gestations resulting in 201 purebred and 196 crossbred calves, was obtained. Complete records were kept to provide data on length of gestation, birth weights, calf losses, gains to weaning, performance on pasture and in the feed lot, dressing percentages and carcass grades. These data were treated statistically.

The gestation period required to produce purebred Hereford calves was ten days longer than that required to produce purebred Angus calves. In the case of crossbred calves, crossed both ways, the gestation period was intermediate, indicating that the sire as well as the dam had influence in determining length of gestation.

Calves of the Angus breed were lighter at birth than calves of the Herefords. The crossbred calves, both crosses, were intermediate. When the difference in length of gestation was considered, the birth weights of all groups of calves were similar.

There were fewer losses of the crossbred calves at birth or as young calves than of the purebred calves.

Calves from the Angus cows, both purebred and crossbred, were heavier at weaning than calves, purebred and crossbred, from the Hereford cows. However, crossbred calves from both the Hereford and the Angus cows outgained the corresponding groups of purebred calves from birth to weaning.

Calves from the Hereford cows gained more on pasture than the calves from the Angus cows. A calculation of the gains on pasture on the basis of weaning weights shows that a greater than average weaning weight resulted in less than average gain on pasture. The heifers, both purebred and crossbred, from the Angus cows gained the least on pasture. This difference cannot be explained by differences in weaning weights.

The first two calf crops were fed protein supplement more liberally than the last six calf crops. The Angus and Hereford bulls that sired

the first four calf crops were larger than the bulls of the respective breeds used during the last four years. The purebred Herefords and both crossbred groups gained more rapidly in the feed lot than the purebred Angus steers and heifers.

The purebred Herefords made the most efficient gains in the feedlot. They were followed, respectively, by the crossbred calves, both steer and heifer, from the Hereford and from the Angus cows. The difference in feed efficiency between calves crossed either way was not statistically significant. The purebred Angus calves made the least efficient gains in the feed lot in this test.

All groups of calves from the Angus cows had a higher dressing percentage than corresponding groups of calves from the Hereford cows. The crossbreds from the Hereford cows had a slightly higher dressing percentage than the purebred calves from the Angus cows.

The crossbred calves, steers and heifers, from the Angus cows yielded the highest grading carcasses of all the groups, followed by the purebred Angus calves. The crossbred steers from the Hereford cows yielded higher grading carcasses than the purebred Hereford steers. The purebred Hereford heifers yielded higher grading carcasses than the crossbred heifers from the Hereford cows.

On the basis of this experiment the advantages from crossbreeding Angus bulls on Hereford cows are as follows: shorter gestation period; lighter weight calves, less possibility for calving trouble; heavier weaning weights; more rapid daily gain in feed lot; higher dressing percentage; higher proportion of choice carcasses from the steers.

The disadvantages of crossing the Angus bulls on Hereford cows are as follows: less efficient gains in feed lot; fewer choice carcasses in the crossbred heifers than in the purebred Hereford heifers.

The advantages of crossing the Hereford bulls on Angus cows are as follows: heavier weaning weights for crossbred heifers over purebred Angus heifers; greater daily gain, birth to weaning, for the crossbred heifers; slightly greater daily gains on pasture and in the feed lot for the heifers; more efficient use of feed in feed lot; increased dressing percentage; and increased proportion of choice carcasses.

The disadvantages of crossing the Hereford bulls on the Angus cows are as follows: longer gestation period; heavier calves at birth; and lighter weight crossbred steers than purebred Angus steers.

Although size was not considered in the experimental design, some of the results obtained in this test raise the question as to whether there is more opportunity for making progress in beef cattle production by paying attention to size and milk production within a breed rather than by crossing beef breeds of the same size.

APPENDIX

TABLE 2—Average Daily Gain in Feed Lot

	PBAA Males	CBHA Males	PBAA Females	CBHA Females	PBHH Males	CBAH Males	PBHH Females	CBAH Females
First year	1.69	1.79	1.50	1.78	1.82	1.76	1.72	1.66
Second year	1.42	1.84	1.59	1.54	1.81	1.61	1.68	1.54
Third year	1.72	1.63	1.48	1.45	1.62	1.68	1.54	1.65
Fourth year	1.56	1.52	1.42	1.33	1.45	1.71	1.34	1.54
Av. first 4 years	1.58	1.69	1.51	1.53	1.67	1.68	1.53	1.60
Fifth year	2.09	1.76	1.89	1.85	1.89	2.08	1.71	1.85
Sixth year	1.79	1.79	1.64	1.67	1.68	1.65	1.71	1.57
Seventh year	1.59	1.63	1.62	1.69	1.76	1.46	1.73	1.36
Eighth year	1.66	1.88	1.68	1.81	1.89	1.88	1.65	1.71
Av. last 4 years	1.78	1.78	1.71	1.75	1.80	1.85	1.71	1.64
Av. of 8 years	1.64	1.73	1.59	1.63	1.72	1.75	1.61	1.62

Corn and Cob Meal and Soybean Oil Meal Required Per Cwt. of Gain in the Feed Lot

First	627	569	671	608	562	594	570	586
Second	710	610	704	660	570	662	590	646
Third	710	651	718	588	563	608	550	689
Fourth	751	668	765	659	647	699	653	660
Av. first 4 years	711	622	702	632	581	641	598	654
Fifth year	709	729[1]	699	689	621	690	660	676
Sixth	814	783	775	755	660	804	692	815
Seventh	867	834	863	910[1]	804	951	814	985
Eighth	785	722	739	724	689	716	776[2]	749
Av. last 4 years	795	758	762	763[1]	677	747	740	781
Av. of 8 years	741	681	728	698	623	689	663	709

[1] Required more than the corresponding group of purebreds.

[2] Required more feed per cwt. of gain while all other groups of purebred steers and heifers from the Hereford cows required less than the corresponding crossbreds. Also required more feed than corresponding group of PBAA heifers.

TABLE 3.—Gestation Periods

		CALVES FROM ANGUS COWS								CALVES FROM HEREFORD COWS							
		Males				Females				Males				Females			
		PBAA		CBHA		PBAA		CBHA		PBHH		CBAH		PBHH		CBAH	
	Year Calved	No.	Gestation Days	No.	Gestation Days	No.	Gestation Days	No.	Gestation Days	No.	Gestation Days	No.	Gestation Days	No.	Gestation Days	No.	Gestation Days
First Calf Crop, av.	1940	5	271.80	8	280.25	8	270.38	4	280.75	+6	292.83	7	278.86	5	287.80	7	283.71
Second Calf Crop, av.	1941	9	274.00	6	284.0	5	273.20	8	280.13	2	287.5	8	280.50	7	287.14	5	284.80
Av. of first two crops.		14	273.21	14	281.86	13	271.46	12	280.33	8	291.5	15	279.13	12	287.42	12	284.17
Third calf crop, av.	1942	6	279.00	10	280.70	8	278.75	4	280.75	8	287.13	5	284.60	5	278.20	6	285.67
Fourth calf crop, av.	1943	13	279.23	4	282.75	2	276.50	3	285.00	5	290.6	5	289.00	9	290.22	7	285.43
Av. of 3rd and 4th crops		19	279.16	14	281.29	10	278.30	7	282.57	13	288.46	10	286.80	14	285.93	13	285.54
Av. of first 4 crops.		33	276.64	28	281.57	23	274.43	19	281.16	21	289.62	25	282.56	26	286.62	25	284.88
Fifth calf crop, av.	1944	5	276.40	7	287.14	6	275.00	7	281.00	11	283.27	8	286.25	5	283.80	6	284.00
Sixth calf crop, av.	1945	4	280.5	9	284.11	4	277.75	6	282.00	5	292.20	4	284.25	9	283.67	8	280.00
Av. of 5th and 6th crops		9	278.22	16	285.44	10	276.10	13	281.46	16	286.06	12	285.58	14	283.71	14	281.71
Seventh calf crop, av.	1946	7	279.71	2	280.00	8	278.13	5	279.00	6	285.67	4	279.00	*8	283.88	8	282.75
Eighth calf crop, av.	1947	4	275.00	6	281.50	7	276.29	5	282.00	4	284.75	7	283.29	5	284.20	7	282.71
Av. of 7th and 8th crops		11	278.00	8	281.13	15	277.27	10	280.50	10	285.30	11	281.73	13	284.00	15	282.73
Av. of last 4 crops.		20	278.10	24	284.00	25	276.80	23	281.04	26	285.77	23	283.74	27	283.85	29	282.24
Total of 8 calf crops.		53	14,691	52	14,700	48	13,232	42	11,806	47	13,512	48	13,590	53	15,116	54	15,307
Av. of 8 calf crops.		53	277.19	52	282.69	48	275.66	42	281.09	47	287.49	48	283.12	53	285.21	54	283.46

\+ 3 Herefords pasture bred when purchased.

* One calf not included.

101	PBAA—M + F	276.47	
94	CBHA—M + F	281.98	
195	Calves from Angus cows	279.12	
200	Bull calves, all breeds	282.47	
197	Heifer calves, all breeds	281.53	
397	Calves	282.00	
201	Purebred calves, both breeds, both sexes	281.35	
196	Crossbred calves, both crosses, both sexes	282.67	
100	PBHH—M + F	286.28	
102	CBAH—M + F	283.30	
202	Calves from Hereford cows	284.78	

TABLE 4.—Summary of Birth Weights

		CALVES FROM ANGUS COWS								CALVES FROM HEREFORD COWS							
		Males				Females				Males				Females			
		PBAA		CBHA		PBAA		CBHA		PBHH		CBAH		PBHH		CBAH	
	Year Calved	No.	Birth weight lb.	No.	Birth weight lb.	No.	Birth weight lb.	No.	Birth weight lb.	No.	Birth weight lb.	No.	Birth weight lb.	No.	Birth weight lb.	No.	Birth weight lb.
First calf crop	1940	5	54.0	8	55.75	8	47.37	4	54.5	9	67.0	7	57.71	5	66.20	7	58.57
Second calf crop	1941	9	50.33	6	60.33	5	47.8	8	53.87	2	69.0	8	63.5	7	67.71	5	59.2
Two year average		14	51.64	14	57.71	13	47.54	12	54.08	11	67.36	15	60.80	12	67.08	12	58.83
Third calf crop	1942	6	69.5	10	61.9	8	58.63	4	61.5	8	60.12	5	68.8	5	63.8	6	63.33
Fourth calf crop	1943	13	64.31	4	67.0	2	58.00	3	60.66	5	68.6	5	69.6	9	67.66	7	67.43
Two year average		19	65.95	14	63.36	10	58.5	7	61.14	13	63.38	10	69.20	14	66.21	13	65.54
Av. first 4 years		33	59.88	28	60.54	23	52.30	19	56.68	24	65.21	25	64.16	26	66.62	25	62.32
Fifth calf crop	1944	5	66.8	7	70.71	6	62.16	7	65.0	11	66.18	8	68.87	5	66.0	6	65.5
Sixth calf crop	1945	4	69.5	9	74.33	4	55.50	6	69.5	5	72.8	4	68.0	9	65.0	8	59.37
Two year average		9	68.0	16	72.75	10	59.50	13	67.08	16	68.25	12	68.58	14	65.36	14	62.0
Av. for 6 years		42	61.62	44	64.98	33	54.48	32	60.91	40	66.43	37	65.59	40	66.18	39	62.21
Seventh calf crop	1946	7	66.14	2	69.5	8	60.37	5	63.4	6	79.66	4	71.75	9	72.11	8	63.0
Eighth calf crop	1947	4	63.5	6	71.5	7	59.0	5	73.8	4	81.5	7	72.0	5	72.8	7	64.57
Two year average		11	65.18	8	71.0	15	59.73	10	68.6	10	80.4	11	71.91	14	72.36	15	63.73
Av. for last 4 years		20	66.45	24	72.17	25	59.64	23	67.74	26	72.92	23	70.17	28	68.86	29	62.90
Av. for 8 years		53	62.36	52	65.90	48	56.13	42	62.74	50	69.22	48	67.04	54	67.78	54	62.64

53	Purebred Angus bull calves	62.36	
48	Purebred Angus heifer calves	56.13	
52	Crossbred bull calves, Angus cows	65.90	
42	Crossbred heifer calves, Angus cows	62.74	
101	Purebred Angus	59.40	
94	Crossbred from Angus cows	64.49	
105	Bull calves from Angus cows	64.11	
90	Heifer calves from Angus cows	59.21	
195	Calves from Angus cows	61.85	
50	Purebred Hereford bull calves	69.22	
54	Purebred Hereford heifer calves	67.78	
48	Crossbred bull calves, Hereford cows	67.04	
54	Crossbred heifer calves, Hereford cows	62.64	
104	Purebred Herefords	68.47	
102	Crossbred from Hereford cows	64.71	
98	Bull calves from Hereford cows	68.15	
108	Heifer calves from Hereford cows	65.20	
206	Calves from Hereford cows	66.61	

401 Calves averaged 64.29

TABLE 5.—Summary of Eight Years—Weaning Weights

Weaning weights, by groups	Year Calved	CALVES FROM ANGUS COWS								CALVES FROM HEREFORD COWS							
		Males				Females				Males				Females			
		PBAA		CBHA		PBAA		CBHA		PBHH		CBAH		PBHH		CBAH	
		No.	lb.	No.	lb.	No.	lb.	No.	lb.	No.	lb.	No.	lb.	No.	lb.	No.	lb.
First calf crop	1940	5	2213	7	2829	8	3101	4	1706	9	3740	6	2501	5	1831	7	2829
Second calf crop	1941	8	3530	6	2937	5	2200	8	3369	2	744	8	3127	6	2287	5	1808
Av. of 1st and 2nd calf crop.		13	441.8	13	443.5	13	407.8	12	422.9	11	407.6	14	402.0	11	374.4	12	386.4
Third calf crop	1942	6	3305	10	4845	7	3513	4	1628	8	3015	5	2059	5	1727	5	2268
Fourth calf crop	1943	12	6358	4	2165	2	966	3	1281	5	2202	5	2364	9	3790	7	2660
Av. of 3rd and 4th calf crop.		18	536.8	14	500.7	9	497.7	7	415.6	13	401.3	10	442.3	14	394.1	12	410.7
Total for 1st 4 calf crops..		31	15,406	27	12,776	22	9,780	19	7,984	24	9,701	24	10,051	25	9,635	24	9,565
Av. of 1st 4 calf crops		31	497.0	27	473.2	22	444.5	19	420.2	24	404.2	24	418.8	25	385.4	24	398.5
Fifth calf crop	1944	4	1997	7	3302	5	2235	7	3222	8	2974	8	3495	5	1737	6	2246
Sixth calf crop	1945	4	1821	8	3712	4	1448	6	2417	5	1605	4	1732	7	2558	7	3000
Av. of 5th and 6th calf crop.		8	477.3	15	467.6	9	409.2	13	433.8	13	352.2	12	435.6	12	357.9	13	403.5
Total for 1st 6 calf crops..		39	19,224	42	19,790	31	13,463	32	13,623	37	14,280	36	15,278	37	13,930	37	14,811
Av. of 1st 6 calf crops		39	492.9	42	471.2	31	434.3	32	425.7	37	385.9	36	424.4	37	376.5	37	400.3
Seventh calf crop	1946	6	2919	2	1080	4	1559	5	2660	5	2182	3	1335	9	3585	4	1745
Eighth calf crop	1947	4	1682	6	2761	7	2606	5	2487	4	1647	7	3276	5	2158	7	2372
Av. of 7th and 8th calf crop.		10	460.1	8	480.1	11	416.5	10	514.7	9	425.4	10	401.1	14	410.2	11	374.3
Av. of last four calf crops..		18	467.7	23	472.0	20	392.4	23	469.0	22	382.2	22	447.2	26	386.1	24	390.1
Total for eight calf crops..		49	23,825	50	23,631	42	17,628	42	18,770	46	18,109	46	19,889	51	19,673	48	18,928
Av. of 8 calf crops		49	486.2	50	472.6	42	419.7	42	446.9	46	393.7	46	432.4	51	385.7	48	394.3

99	Steer calves from Angus cows	479.4	
84	Heifer calves from Angus cows	433.3	
91	P. B. calves from Angus cows	455.5	
92	C. B. calves from Angus cows	460.9	
191	Steer calves	447.4	
183	Heifer calves	409.8	
92	Steer calves from Hereford cows	413.0	
99	Heifer calves from Hereford cows	389.9	
97	P. B. calves from Hereford cows	389.5	
94	C. B. calves from Hereford cows	412.9	
188	P. B. calves from both breeds	421.5	
186	C. B. calves from both breeds	436.7	

TABLE 6.—Summary of Eight Calf Crops, Average Gain and Age, to Weaning

Days of age at weaning Average number of days per calf—by groups	Year Calved	CALVES FROM ANGUS COWS								CALVES FROM HEREFORD COWS							
		Males				Females				Males				Females			
		PBAA		CBHA		PBAA		CBHA		PBHH		CBAH		PBHH		CBAH	
		No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days
First calf crop	1940–41	5	221.2	7	208.4	8	221.6	4	208.0	9	207.7	6	201.3	5	195.6	7	206.9
Second calf crop	1941–42	8	229.4	6	218.2	5	238.0	8	214.3	2	196.0	8	221.3	6	210.0	5	216.4
Third calf crop	1942–43	6	230.2	10	223.6	7	234.6	4	216.0	8	213.8	5	216.4	5	202.4	5	218.0
Fourth calf crop	1943–44	12	238.3	4	240.5	2	247.0	3	206.3	5	226.0	5	226.2	9	222.1	7	201.4
Av. of first 4 calf crops		31	231.7	27	221.0	22	231.8	19	212.1	24	212.6	24	216.3	25	210.0	24	209.6
Fifth calf crop	1944–45	4	245.3	7	228.7	5	237.6	7	231.3	8	227.6	8	221.3	5	225.0	6	207.2
Sixth calf crop	1945–46	4	220.8	8	222.1	4	207.3	6	207.2	5	207.4	4	224.3	7	216.3	7	238.0
Seventh calf crop	1946–47	6	246.5	2	235.5	4	204.0	5	256.6	5	217.8	3	227.0	9	232.1	4	249.0
Eighth calf crop	1947–48	4	243.8	6	258.3	7	239.0	5	259.4	4	253.0	7	249.3	5	240.6	7	217.7
Av. of last 4 calf crops		18	239.9	23	234.7	20	225.3	23	236.6	22	225.4	22	231.5	26	228.1	24	226.2
Av. of all eight calf crops		49	234.7	50	227.3	42	228.7	42	225.5	46	218.7	46	223.6	51	219.2	48	217.9
Average daily gain, birth to weaning, in pounds		No.	lb.	No.	lb.	No.	lb.	No.	lb.	No.	lb.	No.	lb.	No.	lb.	No.	lb.
First calf crop	1940–41	5	1.76	7	1.68	8	1.54	4	1.79	9	1.68	6	1.79	5	1.53	7	1.67
Second calf crop	1941–42	8	1.70	6	1.97	5	1.65	8	1.71	2	1.55	8	1.48	6	1.49	5	1.40
Av. for 1st and 2nd years		13	1.72	13	1.82	13	1.58	12	1.74	11	1.66	14	1.60	11	1.51	12	1.55
Third calf crop	1942–43	6	2.09	10	1.89	7	1.89	4	1.60	8	1.48	5	1.59	5	1.39	5	1.79
Fourth calf crop	1943–44	12	1.95	4	1.97	2	1.72	3	1.78	5	1.65	5	1.78	9	1.59	7	1.55
Av. of 3rd and 4th crops		18	2.00	14	1.91	9	1.85	7	1.67	13	1.55	10	1.69	14	1.52	12	1.66
Av. of first 4 calf crops		31	1.89	27	1.87	22	1.70	19	1.71	24	1.59	24	1.64	25	1.52	24	1.60
Fifth calf crop	1944–45	4	1.74	7	1.75	5	1.63	7	1.71	8	1.33	8	1.66	5	1.25	6	1.49
Sixth calf crop	1945–46	4	1.75	8	1.75	4	1.48	6	1.61	5	1.20	4	1.63	7	1.38	7	1.55
Av. of 5th and 6th calf crops		8	1.74	15	1.75	9	1.57	13	1.67	13	1.28	12	1.65	12	1.32	13	1.52
Seventh calf crop	1946–47	6	1.71	2	2.00	4	1.60	5	1.83	5	1.64	3	1.64	9	1.41	4	1.52
Eighth calf crop	1947–48	4	1.46	6	1.51	7	1.31	5	1.63	4	1.31	7	1.59	5	1.49	7	1.26
Av. of 7th and 8th calf crops		10	1.61	8	1.62	11	1.41	10	1.73	9	1.48	10	1.60	14	1.44	11	1.36
Av. of last four calf crops		18	1.67	23	1.70	20	1.48	23	1.70	22	1.36	22	1.63	26	1.39	24	1.45
Av. of eight calf crops		49	1.80	50	1.79	42	1.59	42	1.70	46	1.48	46	1.63	51	1.45	48	1.52

91 PBAA steers and heifers	1.71	97 PBHH steers and heifers	1.46
92 CBHA steers and heifers	1.75	94 CBAH steers and heifers	1.58
99 PB and CB steer calves from Angus cows	1.80	92 PB and CB steer calves from Hereford cows	1.56
84 PB and CB heifer calves from Angus cows	1.65	99 PB and CB heifer calves from Hereford cows	1.48
183 Calves from Angus cows	1.73	191 Calves from Hereford cows	1.52

188 P. B. calves from Angus and Hereford cows 1.59
186 C. B. calves from Angus and Hereford cows 1.66
374 Calves on test 1.62

TABLE 7.—Summary of Feed Lot Performance—Calves from Angus Cows

	Days in feed lot	NUMBER OF CALVES, STEER DAYS, GAIN, FEEDS FED							AVERAGE DAILY			FEEDS PER CWT. OF GAIN			
		No.	Steer days in lot	Total gain	Corn and cob meal	Supplement	Corn silage	Mixed hay	Gain	Corn and cob meal	Supplement	Corn and cob meal	Supplement	Silage	Hay
PBAAM															
First year	210	5	1,050	1,770	8,709.5	2,385.	6,074.6	1,464.6	1.69	8.3	2.3	492.1	134.7	343.2	82.7
Second year	210	8	1,680	2,383	13,882.7	3,024.	8,153.1	2,266.8	1.42	8.3	1.8	582.6	126.9	342.1	95.1
Third year	224	6	1,344	2,315	14,407.6	2,016.	6,713.3	1,836.7	1.72	10.7	1.5	622.4	87.1	290.0	79.3
Fourth year	215 for 11	12	2,575	4,012	26,245.4	3,862.5	12,812.6	3,574.5	1.56	10.2	1.5	654.2	96.3	319.4	89.1
Total for 4 years	280 for 1	31	6,649	10,480	63,245.2	11,287.5	33,753.6	9,142.6							
Average of 4 years									1.58	9.5	1.70	603.5	107.7	322.1	87.2
Fifth year	196	4	784	1,639	10,441.0	1,176.0	3,920.0	1,572.0	2.09	13.3	1.5	637.0	71.8	239.2	95.9
Sixth year	224	4	896	1,600	11,686.0	1,344.0	4,480.0	1,792.0	1.79	13.0	1.5	730.4	84.0	280.0	112.0
Seventh year	168	6	1,008	1,604	12,401.0	1,512.0	5,040.0	2,016.0	1.59	12.3	1.5	773.1	94.3	314.2	125.7
Eighth year	133	4	532	885	6,151.0	798.0	2,660.0	1,064.0	1.66	11.6	1.5	695.0	90.2	300.6	120.2
Total last 4 years		18	3,220	5,728	40,679.0	4,830.0	16,100.0	6,444.0							
Average last 4 years									1.78	12.6	1.5	710.2	84.3	281.1	112.4
Total for eight years		49	9,869	16,208	103,924.2	16,117.5	49,853.6	15,586.6							
Aver. for eight years									1.64	10.5	1.63	641.2	99.4	307.6	96.2
CBHAM															
First year	210	7	1,470	2,637	11,672.3	3,339.0	8,369.1	2,027.8	1.79	7.9	2.3	442.6	126.6	317.4	76.9
Second year	210	6	1,260	2,321	11,896.5	2,262.8	6,150.5	1,712.3	1.84	9.4	1.8	512.6	97.5	265.0	73.8
Third year	224	10	2,240	3,649	20,380.0	3,360.0	11,162.7	3,056.6	1.63	9.1	1.5	558.5	92.1	305.9	83.8
Fourth year	215	4	860	1,307	7,439.2	1,290.0	4,275.3	1,185.7	1.52	8.7	1.5	569.2	98.7	327.1	90.7
Total and average for first 4 years		27	5,853	9,914	51,388.0	10,251.8	29,957.6	7,982.4	1.69	8.8	1.8	518.3	103.4	302.2	80.5
Fifth year	196	7	1,372	2,416	15,544.0	2,058.0	6,860.0	2,751.0	1.76	11.3	1.5	643.4	85.2	283.9	113.9
Sixth year	224	8	1,792	3,214	22,482.0	2,688.0	8,960.0	3,584.0	1.79	12.5	1.5	699.5	83.6	278.8	111.5
Seventh year	168	2	336	548	4,067.0	504.0	1,680.0	672.0	1.63	12.1	1.5	742.2	92.0	306.6	122.6
Eighth year	133	6	798	1,490	9,577.0	1,197.0	3,990.0	1,596.0	1.88	12.0	1.5	642.8	80.3	267.8	107.1
Total and average for last four years		23	4,298	7,668	51,670.0	6,447.0	21,490.0	8,603.0	1.78	12.0	1.5	673.8	84.1	280.3	102.2
Total and average for eight years		50	10,151	17,582	103,058.0	16,698.8	51,447.6	16,585.4	1.73	10.2	1.65	586.2	95.0	292.6	94.3
PBAAF															
First year	210	8	1,680	2,525	13,117.0	3,816.0	9,601.5	2,324.1	1.50	7.8	2.3	519.5	151.1	380.3	92.0
Second year	210	5	1,036	1,642	9,697.0	1,864.8	5,062.6	1,403.8	1.59	9.4	1.8	590.1	113.6	308.2	85.5
Third year	224	7	1,568	2,319	14,305.7	2,352.0	7,788.8	2,133.6	1.48	9.1	1.5	616.9	101.4	335.9	92.0
Fourth year	215	2	430	610	4,023.3	645.0	2,136.8	595.3	1.42	9.4	1.5	659.6	105.7	350.3	97.6

TABLE 7.—Continued—Summary of Feed Lot Performance—Calves from Angus Cows

PBAAF (Cont.)	Days in feed lot	NUMBER OF CALVES, STEER DAYS, GAIN, FEEDS FED							AVERAGE DAILY			FEEDS PER CWT. OF GAIN			
		No.	Steer days in lot	Total gain	Corn and cob meal	Supplement	Corn silage	Mixed hay	Gain	Corn and cob meal	Supplement	Corn and cob meal	Supplement	Silage	Hay
Total and average for four years		22	4,714	7,096	41,143.0	8,677.8	24,589.7	6,456.8	1.51	8.73	1.8	579.8	122.3	346.5	91.0
Fifth year	3–133 2–196	5	791	1,494	9,260.0	1,186.5	3,955.0	1,587.0	1.89	11.7	1.5	619.8	79.4	264.7	106.2
Sixth year	182	4	728	1,196	8,178.0	1,092.0	3,640.0	1,456.0	1.64	11.2	1.5	683.8	91.3	304.4	121.7
Seventh year	168	4	672	1,088	8,382.0	1,008.0	3,360.0	1,344.0	1.62	12.5	1.5	770.4	92.6	308.8	123.5
Eighth year	133	7	896	1,503	9,768.5	1,344.0	4,480.0	1,792.0	1.68	10.9	1.5	649.9	89.4	298.1	119.2
Total and average for last 4 years		20	3,087	5,281	35,588.5	4,630.5	15,435.0	6,179.0	1.71	11.5	1.5	673.9	87.7	292.3	117.0
Total and average for eight years		42	7,801	12,377	76,731.5	13,308.5	40,024.7	12,635.8	1.59	9.8	1.7	620.0	107.5	323.4	102.1
CBHAF															
First year	210	4	840	1,494	7,167.6	1,908.0	4,813.8	1,158.6	1.78	8.5	2.3	479.8	127.7	322.2	77.6
Second year	210	8	1,680	2,579	13,986.6	3,024.0	8,168.3	2,271.4	1.54	8.3	1.8	542.3	117.3	316.7	88.1
Third year	224	4	896	1,303	6,322.2	1,343.3	4,456.3	1,218.9	1.45	7.1	1.5	485.2	103.1	342.0	93.6
Fourth year	2–215 1–280	3	710	946	5,163.9	1,065.0	3,513.8	982.3	1.33	7.3	1.5	545.9	112.6	371.4	103.8
Total and average for four years		19	4,126	6,322	32,640.3	7,340.3	20,952.2	5,631.2	1.53	7.9	1.8	516.3	116.1	331.4	89.1
Fifth year	5–133 2–196	7	1,057	1,951	11,851.0	1,585.5	5,285.0	2,121.0	1.85	11.2	1.5	607.4	81.3	270.9	108.7
Sixth year	182	6	1,092	1,822	12,116.0	1,638.0	5,460.0	2,184.0	1.67	11.1	1.5	665.0	89.9	299.7	119.9
Seventh year	168	5	840	1,416	11,621.5	1,260.0	4,200.0	1,680.0	1.69	13.8	1.5	820.7	89.0	296.6	118.6
Eighth year	133	5	665	1,201	7,697.5	997.5	3,325.0	1,330.0	1.81	11.6	1.5	640.9	83.1	276.9	110.7
Total and average for last four years		23	3,654	6,390	43,286.0	5,481.0	18,270.0	7,315.0	1.75	11.8	1.5	677.4	85.8	285.9	114.5
Total and average for eight years		42	7,780	12,712	75,926.3	12,821.3	39,222.2	12,946.2	1.63	9.8	1.6	597.3	100.9	308.5	101.8
PBAAM—8 years		49	9,869	16,208	103,924.2	16,117.5	49,853.6	15,586.6	1.64	10.5	1.63	641.2	99.4	307.6	96.2
PBAAF—8 years		42	7,801	12,377	76,731.5	13,308.5	40,024.7	12,635.8	1.59	9.8	1.7	620.0	107.5	323.4	102.1
Total and average, all PBA		91	17,670	28,585	180,655.7	29,426.0	89,878.3	28,222.4	1.62	10.2	1.67	632.0	102.9	314.4	98.7
CBHAM—8 years		50	10,151	17,582	103,058.0	16,698.8	51,447.6	16,585.4	1.73	10.2	1.65	586.2	95.0	292.6	94.3
CBHAF—8 years		42	7,780	12,712	75,926.3	12,821.3	39,222.2	12,946.2	1.63	9.8	1.6	597.3	100.9	308.5	101.8
Total and average all CBA		92	17,931	30,294	178,984.3	29,520.1	90,669.8	29,531.6	1.69	10.0	1.65	590.8	97.4	299.3	97.5

TABLE 8.—Summary of Feed Lot Performance—Calves from Hereford Cows

	Days in feed lot	NUMBER OF CALVES, STEER DAYS, GAIN, FEEDS FED							AVERAGE DAILY			FEEDS PER CWT. OF GAIN			
		No. of calves	Steer days in lot	Total gain	Corn and cob meal	Supplement	Corn silage	Mixed hay	Ave. daily gain	Corn and cob meal	Supplement	Corn and cob meal	Supplement	Silage	Hay
P B H H M															
First year	210	9	1,890	3,445.0	15,069.4	4,293.0	10,808.1	2,602.7	1.82	8.0	2.3	437.4	124.6	313.7	75.6
Second year	210	2	420	760	3,580.8	754.1	2,063.6	570.7	1.81	8.5	1.8	471.2	99.2	271.5	75.1
Third year	224	8	1,652	2,671.0	12,550.2	2,478.0	8,230.8	2,246.8	1.62	7.6	1.5	469.9	92.8	308.2	84.1
Fourth year	2–215 3–280	5	1,270	1,837.0	9,981.3	1,905.0	6,307.4	1,773.1	1.45	7.9	1.5	543.3	103.7	343.4	96.5
Total and average, first four years		24	5,232	8,713.0	41,181.7	9,430.1	27,409.9	7,193.3	1.67	7.9	1.8	472.6	108.2	314.6	82.6
Fifth year	196	8	1,400	2,639.0	14,292.0	2,100.0	7,000.0	2,872.0	1.89	10.2	1.5	541.6	79.6	265.3	108.8
Sixth year	224	5	1,120	1,878.0	10,714.0	1,680.0	5,600.0	2,240.0	1.68	9.6	1.5	570.5	89.5	298.2	119.3
Seventh year	168	5	742	1,307.0	9,396.9	1,113.0	3,710.0	1,484.0	1.76	12.7	1.5	719.0	85.2	283.9	113.5
Eighth year	133	4	532	1,006.0	6,134.0	798.0	2,660.0	1,064.0	1.89	11.5	1.5	609.8	79.3	264.4	105.8
Total and average, last four years		22	3,794	6,830.0	40,536.9	5,691.0	18,970.0	7,660.0	1.80	10.7	1.5	593.5	83.3	277.7	112.2
Total and average, eight years		46	9,026	15,543.0	81,718.6	15,121.1	46,379.9	14,853.3	1.72	9.1	1.7	525.8	97.3	298.4	95.6
C B A H M															
First year	210	6	1,260	2,216.0	10,298.4	2,862.0	7,241.6	1,759.1	1.76	8.2	2.3	464.7	129.2	326.8	79.4
Second year	210	8	1,680	2,704.0	14,884.4	3,024.0	8,195.9	2,277.3	1.61	8.8	1.8	550.5	111.8	303.1	84.2
Third year	224	5	1,120	1,883.0	9,764.5	1,680.0	5,579.6	1,524.7	1.68	8.7	1.5	518.6	89.2	296.3	81.0
Fourth year	4–215 1–280	5	1,140	1,944.0	11,873.3	1,710.0	5,669.9	1,585.0	1.71	10.4	1.5	610.8	88.0	291.7	81.5
Total and average, first four years		24	5,200	8,747.0	46,820.6	9,276.0	26,687.0	7,146.1	1.68	9.0	1.8	535.3	106.0	305.1	81.7
Fifth year	196	8	1,526	3,178.0	19,631.5	2,289.0	7,630.0	3,060.0	2.08	12.9	1.5	617.7	72.0	240.1	96.3
Sixth year	224	4	896	1,481.0	10,556.0	1,344.0	4,480.0	1,792.0	1.65	11.8	1.5	712.8	90.8	302.5	121.0
Seventh year	168	3	504	738.0	6,265.0	754.5	2,520.0	1,008.0	1.46	12.4	1.5	848.9	102.2	341.5	136.6
Eighth year	133	7	931	1,750.0	11,125.5	1,396.5	4,655.0	1,862.0	1.88	12.0	1.5	635.7	79.8	266.0	106.4
Total and average, last four years		22	3,857	7,147.0	47,578.0	5,784.0	19,285.0	7,722.0	1.85	12.3	1.5	665.7	80.9	269.8	108.0
Total and average, eight years		46	9,057	15,894.0	94,398.6	15,060.0	45,972.0	14,868.1	1.75	10.4	1.7	593.9	94.8	289.2	93.5
P B H H F															
First year	210	5	1,050	1,810.0	7,940.4	2,383.2	5,982.2	1,444.6	1.72	7.6	2.3	438.7	131.7	330.5	79.8
Second year	210	6	1,260	2,117.0	10,217.5	2,268.0	6,098.4	1,696.8	1.68	8.1	1.8	482.6	107.1	288.1	80.2
Third year	224	5	1,120	1,720.0	7,786.5	1,680.0	5,562.6	1,517.3	1.54	7.0	1.5	452.7	97.7	323.4	88.2

TABLE 8.—Continued—Summary of Feed Lot Performance—Calves from Hereford Cows

PBHHF (Cont.)	Days in feed lot	NUMBER OF CALVES, STEER DAYS, GAIN, FEEDS FED							AVERAGE DAILY			FEEDS PER CWT. OF GAIN			
		No. of calves	Steer days in lot	Total gain	Corn and cob meal	Supplement	Corn silage	Mixed hay	Ave. daily gain	Corn and cob meal	Supplement	Corn and cob meal	Supplement	Silage	Hay
Fourth year	7–215 1–210 1–280	9	1,995	2,676.0	14,484.3	2,992.5	9,886.5	2,756.6	1.34	7.3	1.5	541.3	111.8	369.5	103.0
Total and average, first four years		25	5,425	8,323.0	40,428.7	9,323.7	27,529.7	7,415.3	1.53	7.5	1.7	485.7	112.0	330.8	89.1
Fifth year	196	5	812	1,391.0	7,964.2	1,218.0	4,060.0	1,777.0	1.71	9.8	1.5	572.6	87.6	291.9	127.8
Sixth year	182	7	1,274	2,181.0	13,185.0	1,911.0	6,370.0	2,548.0	1.71	10.3	1.5	604.5	87.6	292.1	116.8
Seventh year	168	8	1,344	2,327.0	16,930.0	2,016.0	6,720.0	2,688.0	1.73	12.6	1.5	727.6	86.6	288.8	115.5
Eighth year	133	5	665	1,099.0	7,530.5	997.5	3,325.0	1,330.0	1.65	11.3	1.5	685.2	90.8	302.5	121.0
Total and average, last four years		25	4,095	6,998.0	45,609.7	6,142.5	20,475.0	8,343.0	1.71	11.1	1.5	651.8	87.8	292.6	119.2
Total and average, eight years		50	9,520	15,321.0	86,038.4	15,466.2	48,004.7	15,758.3	1.61	9.0	1.6	561.6	100.9	313.3	102.9
CBAHF															
First year	210	7	1,470	2,438.0	11,912.7	3,339.0	8,452.5	2,039.4	1.66	8.1	2.3	488.6	136.9	346.7	83.7
Second year	210	5	1,050	1,618.0	8,557.7	1,890.0	5,132.0	1,422.7	1.54	8.2	1.8	528.9	116.8	317.2	87.9
Third year	224	5	1,120	1,842.0	11,004.6	1,680.0	5,588.4	1,525.2	1.65	9.8	1.5	597.4	91.2	303.4	82.8
Fourth year	4–215 3–280	7	1,630	2,509.0	14,115.5	2,445.0	8,101.7	2,276.4	1.54	8.7	1.5	562.6	97.5	322.9	90.7
Total and average, first 4 years		24	5,270	8,407.0	45,590.5	9,354.0	27,274.6	7,263.7	1.60	8.7	1.8	542.3	111.3	324.4	86.4
Fifth year	2–133 4–196	6	1,050	1,942.0	11,545.0	1,575.0	5,250.0	2,106.0	1.85	11.0	1.5	594.5	81.1	270.3	108.4
Sixth year	182	7	1,274	2,001.0	14,391.0	1,911.0	6,370.0	2,548.0	1.57	11.3	1.5	719.2	95.5	318.3	127.3
Seventh year	168	4	672	916.0	8,011.0	1,008.0	3,360.0	1,344.0	1.36	11.9	1.5	874.6	110.0	366.8	146.7
Eighth year	133	7	931	1,593.0	10,535.5	1,396.5	4,655.0	1,862.0	1.71	11.3	1.5	661.4	87.7	292.2	116.9
Total and average, last 4 years		24	3,927	6,452.0	44,482.5	5,890.5	19,635.0	7,860.0	1.64	11.3	1.5	689.4	91.3	304.3	121.8
Total and average, eight years		48	9,197	14,859.0	90,073.0	15,244.5	46,909.6	15,123.7	1.62	9.8	1.7	606.2	102.6	315.7	101.8
PBHHM, 8 years		46	9,026	15,543.0	81,718.6	15,121.1	46,379.9	14,853.3	1.72	9.1	1.7	525.8	97.3	298.4	95.6
PBHHF, 8 years		50	9,520	15,321.0	86,038.4	15,466.2	48,004.7	15,758.3	1.61	9.0	1.6	561.6	100.9	313.3	102.9
Total and average, all PBH		96	18,546	30,864.0	167,757.0	30,587.3	94,384.6	30,611.6	1.66	9.0	1.65	543.5	99.1	305.8	99.2
CBAHM, 8 years		46	9,057	15,894.0	94,398.6	15,060.0	45,972.0	14,868.1	1.75	10.4	1.7	593.9	94.8	289.2	93.5
CBAHF, 8 years		48	9,197	14,859.0	90,073.0	15,244.5	46,909.6	15,123.7	1.62	9.8	1.7	606.2	102.6	315.7	101.8
Total and average, all CBH		94	18,254	30,753.0	184,471.6	30,304.5	92,881.6	29,991.8	1.68	10.1	1.7	599.8	98.7	302.0	97.5

TABLE 9.—Summary of Dressing Percentage and Carcass Grades

	DRESSING PERCENTAGE				CARCASS GRADES							DRESSING PERCENTAGE				CARCASS GRADES						
	No.	Shrunk live wt.	Shrunk car. wt.	Dress %	Ch +	Ch	Ch —	G +	G	G —	‡ Cm.	No.	Shrunk live wt.	Shrunk car. wt.	Dress %	Ch +	Ch	Ch —	G +	G	G —	‡ Cm.
	PBAAM											PBHHM										
First crop of calves	5	3,991.55	2,414.10	60.48		2	1		1	1		9	7,187.70	4,279.28	59.54		4	1	1	2	1	
Second crop	8	5,889.84	3,632.85	61.68		4			4			2	1,537.45	909.67	59.17		2					
Av. 1st and 2nd crops	13	760.10	465.2	61.20								11	793.20	471.70	59.47							
Third crop	6	5,276.80	3,146.32	59.63		5			1			6	4,358.21	2,620.80	60.13		5			1		
Fourth crop	12	10,020.10	6,044.00	60.32	10	1	1					5	3,891.64	2,294.17	58.95	1		4				
Av. 3rd and 4th crops	18	849.80	510.60	60.08								11	750.00	446.80	59.58							
Av. first 4 crops	31	812.2	491.5	60.52								22	771.6	459.30	59.52							
Fifth crop	4	3,884.85	2,312.70	59.53		2			2			7	5,834.55	3,466.12	59.41		2			5		
Sixth crop	4	3,855.75	2,358.52	61.17		4						5	4,049.75	2,455.05	60.62		2			3		
Av. 5th and 6th crops	8	967.60	583.90	60.35								12	823.70	493.40	59.90							
Seventh crop	6	5,339.85	3,197.02	59.87		3	1	2				4	3,501.70	2,106.97	60.17			3			1	
Eighth crop	4	3,060.35	1,817.40	59.39		2	1		1			4	3,225.25	1,884.67	58.44				2			2*
Av. 7th and 8th crops	10	840.00	501.40	59.69								8	840.9	499.00	59.34							
Av. of last 4 crops	18	896.7	538.1	60.01								20	830.60	495.60	59.68							
Av. of 8 crops	49	843.2	508.6	60.32	10	23	4	2	9	1		42	799.70	476.60	59.60	1	15	8	3	11	2	2
	CBHAM											CBAHM										
First crop	7	5,514.45	3,333.52	60.45	1	3			2	1		6	4,704.50	2,844.07	60.46	1	4			1		
Second crop	6	5,227.33	3,145.35	60.17		4			2			8	5,893.72	3,556.80	60.35		3			5		
Av. 1st and 2nd crops	13	826.30	498.4	60.31								14	757.00	457.20	60.40							
Third crop	10	8,083.01	4,928.62	60.98		10						5	3,850.90	2,307.82	59.93		4			1		
Fourth crop	4	3,346.50	2,016.30	60.25	2	2						5	4,141.90	2,470.65	59.65	1	1	3				
Av. 3rd and 4th crops	14	816.40	496.10	60.76								10	799.30	477.80	59.78							
Av. first 4 crops	27	821.20	497.20	60.55								24	774.60	465.80	60.13							
Fifth crop	7	6,217.70	3,793.72	61.01		7						17	6,717.25	4,018.95	59.83		4		1	2		
Sixth crop	8	7,847.30	4,807.72	61.27		7			1			4	3,719.95	2,290.27	61.57		3			1		
Av. 5th and 6th crops	15	937.70	573.40	61.15								11	948.80	573.60	60.45							
Seventh crop	2	1,896.35	1,174.87	61.95	1	1						3	2,492.90	1,522.95	61.09	1	1			1		
Eighth crop	6	5,048.85	3,037.12	60.15		2	1	1	1		1	7	5,946.10	3,512.92	59.08			4	2		1	
Av. 7th and 8th crops	8	868.20	526.50	60.65								10	843.90	503.60	59.67							
Av. last 4 crops	23	913.50	557.10	60.99								21	898.90	540.20	60.10							
Av. of 8 crops	50	863.60	524.70	60.76	4	36	1	1	6	1	1	45	832.6	500.50	60.12	3	20	7	3	11	1	

* One of these a cryptorchid

‡ Commercial

TABLE 9.—Continued—Summary of Dressing Percentage and Carcass Grades

	DRESSING PERCENTAGE				CARCASS GRADES							DRESSING PERCENTAGE				CARCASS GRADES						
	No.	Shrunk live wt.	Shrunk car. wt.	Dress %	Ch +	Ch	Ch —	G +	G	G —	Cm.	No.	Shrunk live wt.	Shrunk car. wt.	Dress %	Ch +	Ch	Ch —	G +	G	G —	Cm.
	PBAAF											PBHHF										
First crop	8	5,655.10	3,488.50	61.69		1	3		2	2		5	3,608.40	2,176.20	60.31		2			3		
Second crop	4	3,099.15	1,941.22	62.64	1	3						6	4,457.15	2,670.52	59.92		5			1		
Av. 1st and 2nd crops	12	729.50	452.50	62.02								11	733.20	440.60	60.09							
Third crop	7	5,582.35	3,375.45	60.47		6			1			5	3,380.45	2,000.70	59.18		5					
Fourth crop	2	1,542.30	932.10	60.44	1	1						9	6,212.85	3,666.00	59.01	1	3	2		3		
Av. 3rd and 4th crops	9	791.60	478.60	60.46								14	685.20	404.80	59.07							
Av. first 4 crops	21	756.10	463.70	61.32								25	706.40	420.50	59.54							
Fifth crop	5	4,064.30	2,416.05	59.45		5						4	3,278.60	1,950.00	59.48		2			2		
Sixth crop	4	2,880.90	1,718.92	59.67		4						7	5,451.40	3,260.40	59.81		5			2		
Av. 5th and 6th crops	9	771.70	459.40	59.54								11	793.60	473.70	59.68							
Seventh crop	4	3,128.25	1,850.55	59.16		1	2		1			8	6,809.40	4,091.10	60.08		5	2		1		
Eighth crop	6	4,156.45	2,436.52	58.62		1	1	1	2	1		5	3,884.85	2,348.77	60.46		1	1	3			
Av. 7th and 8th crops	10	728.50	428.70	58.85								13	822.60	495.40	60.22							
Av. last 4 crops	19	748.90	443.30	59.19								24	809.30	485.40	59.98							
Av. of 8 crops	40	752.70	454.00	60.31	2	22	6	1	6	3		49	756.80	452.30	59.77	1	28	5	3	12		
	CBHAF											CBAHF										
First crop	4	3,201.00	1,975.35	61.71		3			1			7	5,194.35	3,226.27	62.11		3			3	1	
Second crop	8	6,008.18	3,615.30	60.17		5			3			5	3,473.57	2,117.70	60.97		5					
Av. 1st and 2nd crops	12	767.40	465.90	60.71								12	722.30	445.30	61.65							
Third crop	4	2,827.55	1,718.92	60.79		4						5	3,891.64	2,326.35	59.78		5					
Fourth crop	3	2,172.80	1,300.65	59.86	1	1	1					7	5,010.05	2,993.25	59.74	1	3		1	2		
Av. 3rd and 4th crops	7	714.30	431.40	60.39								12	741.80	443.30	59.76							
Av. first 4 crops	19	747.90	453.20	60.59								24	732.10	444.30	60.69							
Fifth crop	7	5,718.15	3,452.47	60.38		7						6	4,796.65	2,880.15	60.05		2			4		
Sixth crop	6	4,830.60	2,976.67	61.62		5			1			7	5,921.85	3,635.77	61.40		4			3		
Av. 5th and 6th crops	13	811.40	494.60	60.95								13	824.50	501.20	60.79							
Seventh crop	5	4,656.00	2,866.50	61.57	2	1	2					4	3,254.35	1,969.50	60.52	1		1	2			
Eighth crop	5	4,253.45	2,552.55	59.59		2	2	1				7	4,801.50	2,861.62	59.60		1	2	3		1	
Av. 7th and 8th crops	10	890.90	541.90	60.82								11	732.40	439.20	59.97							
Av. last 4 crops	23	846.00	515.10	60.89								24	782.30	472.80	60.44							
Av. of 8 crops	42	801.60	487.10	60.77	3	28	5	1	5			48	757.20	458.60	60.56	2	23	3	6	12	2	

TABLE 10.—Gains on Pasture Last Four Calf Crops

	CALVES FROM ANGUS COWS								CALVES FROM HEREFORD COWS							
	Males				Females				Males				Females			
	PBAA		CBHA		PBAA		CBHA		PBHH		CBAH		PBHH		CBAH	
	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.
Fifth calf crop, 153 days	4	.40	7	.52	5	.35	7	.56	8	.67	8	.68	5	.76	6	.76
Sixth calf crop, 140 days	4	1.16	8	1.21	4	.89	6	1.01	5	1.14	4	1.29	7	1.06	7	1.21
Seventh calf crop, 158 days	6	1.21	2	1.23	4	1.03	5	1.11	5	1.38	3	1.44	8	1.25	4	1.19
Eighth calf crop, 147 days	4	1.22	6	1.29	7	1.10	5	1.14	4	1.38	7	1.35	5	1.21	7	1.24
Average of the four years	18	1.02	23	1.02	20	.85	23	.92	22	1.08	22	1.10	25	1.09	24	1.07
All P. B. Angus	38	.93							All P. B. Herefords						47	1.09
All C. B. from Angus cows	46	.97							All C. B. from Hereford cows						46	1.08
All calves from Angus cows	84	.95							All calves from Hereford cows						93	1.08
				All P. B.			85	1.02								
				All C. B.			92	1.03								
				All calves			177	1.02								

Related Literature

PLUMB, C. S. Types and Breeds of Farm Animals. Ginn and Company. Boston, 1906.

LUSH, JAY L. Animal Breeding Plans. The Iowa State College Press. Ames, Ia., 1943.

LUSH, JAY L. Practices and Problems Involved in Crossbreeding Cattle in Coastal Plain of Texas. American Society of Animal Production, pp. 58-61, 1927.

FULLER, J. G. Crossbreeding Types for Baby Beef Production. American Society of Animal Production, pp. 53-57, 1927.

BRAY, C. I. Value of a Brahman Cross on Native and Grade Beef Cattle in Southern Louisiana. American Society of Animal Production, pp. 72-76, 1932.

BLACK, W. H. Developing New Types of Beef Cattle for Semi-tropical Conditions. American Society of Animal Production, pp. 71-73, 1934.

SHAW, A. M., and J. W. MACEWAN. An Experiment on Beef Production in Western Canada. University of Saskatchewan, 1938.

WOODWARD, R. R., R. T. CLARK, and J. N. CUMMINGS. Studies on Large and Small Type Hereford Cattle. Montana Bulletin 401, 1942.

WINTERS, L. M., O. M. KISER, P. S. JORDAN, and W. H. PETERS. A Six Years' Study of Crossbreeding Swine. Minn. Exp. Station Bulletin 320, 1935.

ROBISON, W. L. Crossbreeding for the Production of Market Hogs. Ohio Agricultural Experiment Station Bulletin 675, 1948.

KNAPP, BRADFORD, JR., A. L. BAKER, and R. T. CLARK. Crossbred Beef Cattle for the Northern Great Plains. Circular 810, U. S. D. A., 1949.

This page intentionally blank.

This page intentionally blank.